* NOTICES *

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2.**** shows the word which can not be translated.
3.In the drawings, any words are not translated.

CLAIMS

[Claim(s)]
[Claim 1] Automatic focus equipment equipped with the control means which controls the above-mentioned focal lens driving means to move the above-mentioned focal lens to a predetermined location when the focal lens which performs the focus of a photographic subject image, the focal lens driving means which drive the above-mentioned focal lens, a lens initial-valve-position detection means detect the initial valve position of the above-mentioned focal lens, a mode-setting means set up a mode of operation, and the above-mentioned lens initial-valve-position detection means detect an initial valve position and the above-mentioned mode-setting means sets up a predetermined mode of operation.
[Claim 2] Automatic focus equipment according to claim 1 characterized by the above-mentioned predetermined mode of operation being contiguity photography mode.
[Claim 3] Automatic focus equipment according to claim 1 or 2 characterized by the above-mentioned predetermined mode of operation being the mode which photos a predetermined distance and the photographic subject of magnitude.
[Claim 4] Automatic focus equipment according to claim 1, 2, or 3 characterized by the above-mentioned predetermined location being a near edge in the ranging range.
[Claim 5] the above-mentioned predetermined location -- ranging of near one end -- the automatic focus equipment according to claim 1, 2, or 3 characterized by the thing out of range.
[Claim 6] Automatic focus equipment according to claim 1 characterized by the above-mentioned predetermined mode of operation being usually photography mode.
[Claim 7] Automatic focus equipment according to claim 1 or 6 characterized by the above-mentioned predetermined location being an infinity edge in the ranging range.
[Claim 8] the above-mentioned predetermined location -- ranging of infinity one end -- the automatic focus equipment according to claim 1 or 6 characterized by the thing out of range.
[Claim 9] Automatic focus equipment equipped with the focal lens which performs the focus of a photographic subject image, the focal lens driving means which drives the above-mentioned focal lens, a mode setting means to set up a mode of operation, and the control means which controls the above-mentioned focal lens driving means, and restricts the successive range of the above-mentioned focal lens when the above-mentioned mode setting means has set up the predetermined mode of operation.
[Claim 10] Automatic focus equipment according to claim 9 characterized by the above-mentioned predetermined mode of operation being contiguity photography mode.
[Claim 11] Automatic focus equipment according to claim 9 or 10 characterized by the above-mentioned predetermined mode of operation being the mode which photos a predetermined distance and the photographic subject of magnitude.
[Claim 12] Automatic focus equipment according to claim 9 characterized by the above-mentioned predetermined mode of operation being speed-light-photography mode.
[Claim 13] Automatic focus equipment according to claim 9 characterized by the above-mentioned predetermined mode of operation being the contiguity photography mode which used the stroboscope.
[Claim 14] Automatic focus equipment characterized by providing the following The focal lens which

performs the focus of a photographic subject image The focal lens driving means which drives the above-mentioned focal lens A photo-electric-conversion means to change into an electrical signal the photographic subject image by which image formation was carried out with the above-mentioned focal lens An extract means to extract the high frequency component of the brightness of a photographic subject from the output signal of the above-mentioned photo-electric-conversion means, Based on the signal from a mode setting means to set up a mode of operation, and the above-mentioned extract means, the above-mentioned focal lens driving means is controlled. When the output signal of the above-mentioned extract means acquired by driving the above-mentioned focal lens has not reached predetermined maximum and the above-mentioned mode setting means has set up the predetermined mode of operation, The control means which controls the above-mentioned focal lens driving means to move the above-mentioned focal lens to a predetermined location

[Claim 15] Automatic focus equipment according to claim 14 characterized by the above-mentioned predetermined mode of operation being contiguity photography mode.

[Claim 16] Automatic focus equipment according to claim 14 or 15 characterized by the above-mentioned predetermined mode of operation being the mode which photos a predetermined distance and the photographic subject of magnitude.

[Translation done.]

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DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Industrial Application] This invention relates to the automatic focus equipment used for an electronic "still" camera, a video camera, etc.
[0002]
[Description of the Prior Art] Generally in the automatic focus equipment (henceforth AF equipment) of an electronic "still" camera or a video camera, the method which drives a focal lens using a stepping motor is used. As everyone knows, the so-called open loop control which does not need feedback control is possible for a stepping motor, and since highly precise focal lens positional information is acquired by counting a pulse number, it can be said that it is a motor suitable for AF equipment. When counting a pulse number as mentioned above and acquiring the positional information of a focal lens, he moves a focal lens to a position (henceforth a reset location) first, and was trying to acquire lens positional information from the pulse number from the location, and the lens movement magnitude per step of a motor conventionally. In addition, as for detection of a reset location, the photo interrupter etc. is used.
[0003] Moreover, by this method for which a luminance signal is extracted from the video signal read from the image sensor as an AF method of the video camera which memorizes an animation from the former, and the so-called mountain-climbing AF method using that high frequency component as a focal detecting signal is used, a focal detecting signal moves a focal lens to the location which becomes max, and is performing focus actuation. Moreover, since this method performs AF actuation using the signal read from the image sensor, its special sensor for AF is unnecessary, and it can be realized cheaply.
[0004] Moreover, the electronic "still" camera and the video camera are equipped with various photography modes from the former, and there is some they to which photographic subject distance is limited to some extent. For example, an adapter etc. is loaded with the film in in the so-called macro mode which photos a nearby photographic subject very much and the mode which approaches and photos the photographic subject of specific magnitude, for example, a film photo, and there is the mode (following card mode) which photos the mode (following film adapter mode) which equips with the adapter at the tip of a lens, and photos it, a credit card, a license, a card, etc. In such contiguity photography modes and the usual photography mode, since photographic subject locations differ, in photography mode, the scanning range for the focus check appearance in AF actuation will usually differ from photography mode soon. Also when performing speed light photography furthermore, since the lighting range is restricted according to luminescence capacity, it can be said that photographic subject distance is limited substantially.
[0005]
[Problem(s) to be Solved by the Invention] By the above-mentioned mountain-climbing AF method, since it was dependent on the time interval from which the time amount which AF actuation takes reads the charge accumulated in the image sensor, quick actuation was not completed. That is, as for a focal detecting signal, only the count of predetermined (at NTSC, it is 60 times in 1 second) will be obtained

in unit time amount. The usually same control as the time of photography was performed without performing control special in any way after [which moved the focal lens to the reset location in spite of in other words having limited the successive range of a focal lens] photographic subject distance is limited to some extent in the case of the camera which has usually different above photography mode from photography mode although it is required that AF actuation should be performed in the electronic "still" camera which photos a still picture at high speed. For this reason, since a photographic subject is in a near side in the macro mode and film adapter mode which were mentioned above, although a focusing point is within the predetermined range from a near edge, in having started AF actuation from the reset location, it is useless for that a lens moves to near a focusing point to take time amount, and to scan fields other than the focusing point range. It was very inconvenient when it cut in the time amount nearby of the AF actuation [itself] many when a reset location is located in a location distant from a near edge, and the disadvantageous mountain-climbing AF method for high-speed AF actuation was used.

[0006] Conversely, although photographic subject distance is usually far compared with a macro mode or film adapter mode at the time of photography mode, it is useless to scan near a near edge, and more time amount will be required.

[0007] Moreover, since the lens movement magnitude per step of a stepping motor was very as small as about ten micrometers, it was very difficult by adjusting the attaching position of a photo interrupter at the time of manufacture to set a reset location as a desired location.

[0008] Being able to take [but] only a photograph with an insufficient exposure in fact, even if it furthermore scans except [which can be illuminated] the range at the time of speed light photography and there is a focus, such a photograph will become that meaningless.

[0009] This invention solves the trouble of the conventional AF control which was mentioned above, and it is in the purpose attaining time amount compaction of AF actuation according to photography mode, when a mountain-climbing AF method is used in an electronic "still" camera. Moreover, it is in performing AF actuation over an effective range at the time of speed light photography.

[0010]

[Means for Solving the Problem] The focal lens which performs the focus of a photographic subject image in invention of claim 1, The focal lens driving means which drives the above-mentioned focal lens, and a lens initial-valve-position detection means to detect the initial valve position of the above-mentioned focal lens, A mode setting means to set up a mode of operation, When the above-mentioned lens initial-valve-position detection means detects an initial valve position and the above-mentioned mode setting means sets up a predetermined mode of operation, the control means which controls the above-mentioned focal lens driving means to move the above-mentioned focal lens to a predetermined location is established.

[0011] In invention of claim 9, the focal lens which performs the focus of a photographic subject image, the focal lens driving means which drives the above-mentioned focal lens, a mode setting means to set up a mode of operation, and the control means which controls the above-mentioned focal lens driving means, and restricts the successive range of the above-mentioned focal lens when the above-mentioned mode setting means has set up the predetermined mode of operation are established.

[0012] The focal lens which performs the focus of a photographic subject image in invention of claim 14, The focal lens driving means which drives the above-mentioned focal lens, and a photo-electric-conversion means to change into an electrical signal the photographic subject image by which image formation was carried out with the above-mentioned focal lens, An extract means to extract the high frequency component of the brightness of a photographic subject from the output signal of the above-mentioned photo-electric-conversion means, Based on the signal from a mode setting means to set up a mode of operation, and the above-mentioned extract means, the above-mentioned focal lens driving means is controlled. When the output signal of the above-mentioned extract means acquired by driving the above-mentioned focal lens has not reached predetermined maximum and the above-mentioned mode setting means has set up the predetermined mode of operation, The control means which controls the above-mentioned focal lens driving means to move the above-mentioned focal lens to a

predetermined location is established.

start point of search

[0013]

[Function] According to invention of claim 1, by detecting that a focal lens is in an initial valve position, and setting up a predetermined mode of operation, since movement restriction of the focal lens is carried out from an initial valve position to a predetermined location, the operating time of AF is shortened.

[0014] Since according to invention of claim 9 the successive range of a focal lens is restricted to the predetermined range when it is in a predetermined mode of operation, the operating time of AF is shortened.

[0015] Since according to invention of claim 14 it is in the condition that the extracted high frequency component has not reached max and the focal lens is not focusing and movement restriction of the focal lens is carried out to a predetermined location by setting up a predetermined mode of operation, the operating time of AF is shortened.

[0016]

[Example]

(The 1st example) The example of this invention is explained hereafter, referring to a drawing. Drawing 1 is the block diagram of the electronic camera which applied this invention. In drawing 1 a fixed lens and 102 101 Quantity of light control-section material, such as a diaphragm and a shutter, The motor which 103 extracts and drives a shutter 102, the mechanism system drive circuit where 104 drives a diaphragm, a shutter, etc., A focal lens for 105 to double a focus on the image sensor 109 mentioned later, The photo interrupter as a lens initial-valve-position detection means by which 106 detects the reset location of the focal lens 105, The motor to which 107 moves the focal lens 105, and 108 are focal lens drive circuits from which a motor 107 is driven and the focal lens 105 is moved, and constitute a focal lens driving means with a motor 107.

[0017] The image sensor as a quantity of light conversion means by which 109 changes the reflected light from a photographic subject into an electrical signal, The timing signal generating circuit which generates a timing signal required in order that 110 may operate an image sensor 109, The front-end processing circuit equipped with the nonlinear amplifying circuit which performs 111 before the CDS circuit for the output noise rejection of an image sensor 109, or A/D conversion, A memory controller for an A/D converter and 113 to control buffer memory and for 112 control R/W of buffer memory 113, and refresh actuation of DRAM, as for 114, The microcontroller containing CPU for 115 to control systems, such as a photography sequence, A control unit for the control section which serves as which control means extract means, the actuation display to which 116 expresses the display for actuation assistance and the condition of a camera, and 117 to operate a camera from the outside, and 118 are rewritable nonvolatile memory electrically.

[0018] The expansion unit in which the attachment and detachment for connecting to the body of an electronic camera an interface with the expansion unit 120 which 119 mentions later, and 120, and performing various processings and actuation are free, The interface for connection with the record medium 122 which 121 mentions later, A main switch for 122 to switch on record media, such as a memory card and a hard disk, into a system, and for 123 switch on a power source, A switch for 124 to perform photography standby actuation of AF, AE (automatic exposure), etc. (it considers as the following SW1), The photography switch whose 125 performs photography after actuation of the photography standby switch 124 (it considers as the following SW2), In order that the mode switch as a mode setting means by which 126 sets up photography mode, and 127 may photo a stroboscope and 128 may photo the image of a silver halide film, it is the film adapter which loads with and uses a film.

[0019] Next, actuation of AF equipment by this invention is explained using the flow chart of drawing 2 . First, at step S201 (a step is skipped hereafter), the condition of a main switch 123 is detected, and if it is a power source ON, it will progress to S202. In S202, the remaining capacity of a record medium 122 is investigated, if remaining capacity is 0, it will progress to S203, otherwise, it progresses to S204. In S203, after warning of the remaining capacity of a record medium 122 being 0, it returns to S201. or [in addition, / displaying warning on the actuation display 116] -- or a beep sound is taken out from the voice output section which is not illustrated, or the both are performed. In S204, the focal lens 105 is

reset according to the flow chart of drawing 3 mentioned later.
[0020] Next, in S205, the condition of a mode switch 126 is detected, and if are set as a macro mode or film adapter mode, and that is not right, it will progress to S206 S208. In S206, the number of steps of the motor 107 from a reset location detects the location of the focal lens 105, and if a lens is in a near edge, and there is nothing at a near edge, it will progress to S210 S207. The focal lens 105 is driven and it is made to move to a near edge in S207. The near edge in this case is a near edge in a macro mode or film adapter mode, and is the location which can usually double a focus with a nearby photographic subject further rather than the near edge in photography mode. In S208, the number of steps from a reset location detects the location of the focal lens 105, and if a lens is in an infinity edge, and there is nothing at an infinity edge, it will progress to S210 S209. The focal lens 105 is driven and it is made to move to an infinity edge in S209.
[0021] In S210, the condition of SW1 is investigated, if it is ON, it will progress to S212, otherwise, it progresses to S211. In S211, the condition of a main switch 123 is investigated, and if it is ON, if that is not right, it will return to S205 S201. In S212, photography standby actuation which includes AF actuation according to the flow chart of drawing 5 mentioned later is performed. In S213, the condition of SW2 is investigated, and if it is ON, and that is not right, it will progress to S215 S214. In S214, the condition of SW1 is investigated, if it is ON, it will progress to S213, otherwise, it progresses to S205. In S215, photography actuation is performed according to the flow chart of drawing 6 mentioned later.
[0022] In S216, the remaining capacity of a record medium 122 is investigated, if remaining capacity is 0, it will progress to S218, otherwise, it progresses to S217. In S217, the condition of SW2 is investigated, and if it is not ON, it will progress to S214. In S218, it warns of the remaining capacity of a record medium 122 being 0 like S203, and progresses to S219. or [displaying warning on the actuation display 116] -- or a beep sound is taken out from the voice output section which is not illustrated, or the both are performed. In S219, the condition of a main switch 123 is investigated, and if it is ON, if that is not right, it will return to S216 S201.
[0023] Drawing 3 is a subroutine which shows the contents of the focal lens reset of S204 in drawing 2 . As shown in drawing 4 here, when the focal lens 105 is in infinity one end to the photo interrupter output change location of drawing 4 , the output of a photo interrupter 106 shall be set to "Hi" when it is in "Lo" and near one end. First, by S301, the condition of the output of a photo interrupter 106 is investigated, if it is "Lo", it will progress to S302, otherwise, it progresses to S303. Since it is judged with the focal lens 105 being in infinity one end to a photo interrupter output change location S301 with the output of a photo interrupter 106 in S302, the focal lens 105 is moved to near one end one step. In S303, the condition of the output of a photo interrupter 106 is investigated, if it is "Hi", it will progress to S304, otherwise, a return is carried out to a main routine. Since it is judged with the focal lens 105 being in near one end to a photo interrupter output change location S303 with the output of a photo interrupter 106 in S304, the focal lens 105 is moved to infinity one end one step.
[0024] Next, the actuation at the time of resetting the focal lens 105 as mentioned above is explained. Since the output of a photo interrupter 106 is "Lo" when the location of the focal lens 105 when turning ON a main switch 123 first suits infinity one end to a photo interrupter output change location, one step of focal lenses 105 is moved at a time to near one end by S301 and S302 of drawing 3 until the output of a photo interrupter 106 is set to "Hi." Since the output of a photo interrupter 106 changes to "Hi" in the place beyond the photo interrupter output change location of drawing 4 , it is moved at a time to infinity one end by one step until the output of a photo interrupter 106 is shortly set to "Lo" according to S303 and S304 of drawing 3 .
[0025] Thus, finally the focal lens 105 stops at the reset location of drawing 4 . When the location of the focal lens 105 when turning ON a main switch 123 suits near one end to a photo interrupter output change location, the focal lens 105 is moved only to infinity one end, and if the output of a photo interrupter 106 is set to "Lo", it will stop. In this way, finally the focal lens 105 stops at the reset location of drawing 4 like the case where the location of the focal lens 105 when turning ON the above-mentioned main switch 123 suits infinity one end to a photo interrupter output change location.
[0026] Drawing 5 is a subroutine showing the contents of the photography standby actuation of S212 in

drawing 2 . First, by S501, the condition of a mode switch 126 is detected, and if it is a macro mode, and that is not right, it will progress to S502 S506. Photographic subject brightness is measured in S502. In S503, the photographic subject brightness measured by S502 investigates whether it is beyond a predetermined value, and if it is beyond a predetermined value, and that is not right, it will progress to S504 S505. In S504, the scanning range of AF actuation, i.e., the range to which the focal motor 105 is moved, is set as a predetermined value (1). At the time of macro photography, since it is in the place where a photographic subject is very near, only near should scan. Therefore, the predetermined value in this case (1) is set as the range of 5-50cm as the near range and an example from the fixed lens 101.
[0027] In S505, the scanning range of AF actuation is set as a predetermined value (2) like S504. In this case, since photographic subject brightness is judged by S503 to be below a predetermined value, it becomes the photography which used the stroboscope 127. For this reason, since stroboscope light will be kicked if too not much near, it is set as the range of 15-50cm as the range where light is not kicked, and an example. In S506, the condition of a mode switch 126 is detected, and if it is film adapter mode, and that is not right, it will progress to S507 S508. In S507, the scanning range of AF actuation is set as a predetermined value (3). Supposing the distance to the silver halide film with which the film adapter 128 was loaded from the fixed lens 101 as an example at this time is 10.5cm in a design value, the scanning range will be set as 10-11cm as a predetermined value (3).
[0028] Photographic subject brightness is measured in S508. In S509, the photographic subject brightness measured by S508 investigates whether it is beyond a predetermined value, and if it is beyond a predetermined value, and that is not right, it will progress to S511 S510. In S510, the scanning range is set as a predetermined value (4). In this case, since it is not in a macro mode or film adapter mode, either, it is not necessary to scan the near range. Since photographic subject brightness is furthermore judged by S509 to be below a predetermined value, it becomes the photography which used the stroboscope 127. Since the range which can illuminate a stroboscope 127 is restricted, supposing the range in which the lighting is possible is to 5m as an example, a predetermined value (4) will be set to 50cm - 5m as scanning range.
[0029] Since it is not necessary to scan the near range since it is not in a macro mode or film adapter mode in S511, either, and photographic subject brightness is further judged by S509 to be beyond a predetermined value, a stroboscope is not used. Therefore, it considers as the scanning range of 50cm or more as an example in this case. Not only the value beforehand memorized by the camera but a user can set up the these-set-up scanning range now.
[0030] Next, in S512, it is scan within the limits set up by S504, S505, S507, S510, and S511, and the focal lens 105 is moved and AF actuation is carried out. As an AF method at this time, the above-mentioned mountain-climbing AF method is used. When the maximum of a focal detecting signal is below a predetermined value, above-mentioned mountain-climbing AF is repeated, and it remembers it to be a count line of predetermined that the maximum of a focal detecting signal is below a predetermined value if the result is the same, and progresses to S513. In S513, it investigates whether the maximum of the focal detecting signal obtained by above-mentioned mountain-climbing AF is below a predetermined value. Since focus actuation is performed by moving a focal lens to the location where the focal detecting signal mentioned above in mountain-climbing AF as everyone knows becomes max, focus actuation cannot be performed if maximum is undetectable.
[0031] Therefore, when the maximum of a focal detecting signal is below a predetermined value, the focal lens 105 is moved to a position. If the maximum of a focal detecting signal is below a predetermined value, it will progress to S514, otherwise, it escapes from this subroutine, and returns to a main routine. In S514, the condition of a mode switch 126 is detected, and if it is a macro mode, and that is not right, it will progress to S515 S516. In S515, the focal lens 105 is moved to a predetermined location (1). The predetermined location at this time (1) is set as the location which is equivalent to a general photographic subject distance in macro photography. Or you may set it as the location which corresponds when a field angle is in agreement with the size of a card.
[0032] In S516, the condition of a mode switch 126 is detected, and if it is film adapter mode, and that is not right, it will progress to S517 S518. In S517, the focal lens 105 is moved to a predetermined location

(2). The predetermined location at this time (2) will move the focal lens 105 to the location equivalent to the photographic subject distance of 10.5cm, supposing the distance to the silver halide film with which the film adapter 128 was loaded from the fixed lens 101 as an example is 10.5cm in a design value. In S518, the focal lens 105 is moved to a predetermined location (3). In this case, since it is not in a macro mode or film adapter mode, either, the focal lens 105 is moved to an infinity edge.

[0033] Drawing 6 is a subroutine showing the contents of photography actuation of S215 in drawing 2 . By S601, photographic subject brightness is measured first. In S602, exposure to an image sensor 109 is performed according to the photographic subject brightness measured by S601. Next, in S603, nonlinear processing performed before the output noise rejection of an image sensor 109 or A/D conversion is performed. In S604, the analog signal from the front-end processing circuit 111 is changed into a digital signal. In S605, the output data from A/D converter 112 are temporarily stored in buffer memory 113 through the memory controller 114. In S606, it transmits to the record media 122, such as a memory card equipped with the data in buffer memory 113 through the memory controller 114 and the record-medium interface 121 by the body of a camera.

[0034] Drawing 7 shows the scanning range of the focal lens 105 to photography mode. (a) shows all the scanning range of the focal lens 105. The focal lens 105 scans the particular part of this range according to photography mode so that it may explain below. Moreover, a reset location presupposes that it is in the location shown in drawing. If photography mode is a macro mode and does not use a stroboscope, the range of (b) of drawing 7 is scanned. That is, between the macro near edges which can double a focus with a nearby photographic subject further rather than the usual near edge and it is scanned.

[0035] It is a macro mode, and when a stroboscope is used, the range of (c) is scanned. The macro near side is short rather than the scanning range of the macro mode for which this scanning range does not use a previous stroboscope. This is because stroboscope light will be kicked in a not much near distance. The range of (d) is scanned at the time of film adapter mode. This scanning range is very short range between the usual near edge and a macro near edge. Since photographic subject distance can specify mostly in the case of film adapter mode, the scanning range is good in the very short range. Usually, the range of (e) is scanned at the time of photography mode. This scanning range is between the usual near edge and an infinity edge. The range of (f) is scanned at the time of speed-light-photography mode. As for this scanning range, infinity one end is usually short rather than the scanning range of photography mode. This is for not scanning the range which stroboscope light does not reach.

[0036] After resetting the focal lens 105, it is made to move to a near edge, if the camera is set as a macro mode or film adapter mode when constituted like drawing 1 . Usually, after resetting the focal lens 105, it is made to move to an infinity edge, if it is in photography mode. The time amount to which the focal lens 105 moves the range which does not need to be scanned when carrying out like this, and SW1 is set to ON next and AF actuation is started can be shortened. Moreover, since the scanning range is changed and set up according to photography mode or photography conditions, it is not necessary to scan the useless range, and the time amount which AF actuation takes can be shortened.

[0037] Moreover, since it is set as the scanning range according to the effective lighting range when using a stroboscope 127, futility which scans the range which stroboscope light does not reach can be lost. Since the focal lens 105 is moved to the location according to photography mode beforehand set up since a focus could not be doubled when the maximum of a focal detecting signal was below a predetermined value, as a result of performing AF actuation furthermore, photoing large dotage at least is avoided.

[0038] (The 2nd example) Next drawing 8 is used and the 2nd example of this invention is explained. This changes S207 and S209 of drawing 2 in the 1st above-mentioned example into S807 and S809. Since S201-S208 of others, and processing of S210-S219 are the same as drawing 2 , explanation is omitted. In drawing 8 , the focal lens 105 is moved from the ranging out of range by the side of near, i.e., a near edge, by S807 out of the range which can actually be ranged by the number step. By doing in this way, the near edge of the ranging range can be certainly scanned at the time of actual AF actuation. By S809, the focal lens 105 is similarly moved to the ranging out of range by the side of infinity, i.e., the outside of the range which can actually be ranged by the number step from an infinity edge. At the time

of actual AF actuation, the infinity edge of the ranging range can be certainly scanned by doing in this way.

[0039] As explained above, when photography mode is set as a macro mode or film adapter mode according to each example, he is trying to move the focal lens 105 to a near edge after reset of the focal lens 105. Moreover, when photography mode is usually set as photography mode, he is trying to move the focal lens 105 to an infinity edge after reset of the focal lens 105. Moreover, according to photography mode or photography conditions, he changes the scanning range of AF, and is trying to set up. When focal detection is still more difficult, he is trying to move a focal lens to the location set up beforehand.

[0040] In addition, in above-mentioned explanation, although the concrete numeric value showed each mode, the scanning range according to photography conditions, and the predetermined location that moves the focal lens 105 when the maximum of a focal detecting signal is below a predetermined value, this is an example to the last and is not limited to this. Moreover, it may warn, when the maximum of a focal detecting signal is below a predetermined value, and you may constitute so that a photograph may not be taken. Moreover, although it moved to the near edge in film adapter mode after resetting the focal lens 105, you may move to the predetermined location of scan [not a near edge but] within the limits. Same control may be carried out in the mode which furthermore photos not only film adapter mode but a credit card, a license, a card, etc.

[0041]

[Effect of the Invention] Since it constituted according to this invention so that a lens initial valve position might be detected and a focal lens might be moved to a predetermined location at the time of a predetermined mode of operation as explained above, it is effective in the ability to shorten the time amount which AF takes.

[0042] It is effective in the ability to shorten the time amount which AF takes by moving a focal lens to a near edge after reset of a focal lens especially at the time of the photography mode in which photographic subject distance, such as a macro mode and film adapter mode, is very near.

[0043] Moreover, it is effective in the ability to shorten the time amount which AF takes, without scanning the useless range, since AF actuation can be performed in the optimal range according to each photography mode and photography conditions by changing the scanning range (successive range of a focal lens) according to photography mode or photography conditions (photographic subject brightness).

[Translation done.]

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TITLE: OPTICAL EQUIPMENT

PUBN-DATE: June 14, 1994

INVENTOR-INFORMATION:
NAME

KANEDA, NAOYA

ASSIGNEE-INFORMATION:
NAME COUNTRY
CANON INC N/A

- in-focus
- Start point
- motor
- Lens

APPL-NO: JP04345549

APPL-DATE: November 30, 1992

INT-CL (IPC): G02B007/09, G02B007/08 , H04N005/232

ABSTRACT:

PURPOSE: To shorten the time required to obtain an in-focus screen after
power-ON operation by automatically adjusting the focus simultaneously within
the time wherein a lens group is moved to a position detected by a position

detecting means.

CONSTITUTION: Once a stepping motor 137 is driven, an inner focus lens 4 is driven by the output shaft 138 in the direction of the optical axis. The light shield part 156 of a photointerrupter is provided integrally with a moving frame 140 and the photointerrupter 159 has a light emitting element 158 and a light receiving element 157 which are arranged opposite each other. When a focus lens 4 is moved to a starting point, the direction detection result of AF is taken into consideration to determine the moving direction; after the movement is started, an evaluation signal of AF is measured and if there is a focusing point halfway, the distance between the focusing position and a reset position is found. After resetting, the lens is moved at a high speed to the focusing position and normal AF operation is started. This method shorten the time required to obtain the in-focus screen.

* NOTICES *

DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Industrial Application] This invention relates to the optical instrument which moves the lens of the class called the zoom lens used for taking lenses, such as a video camera, especially an inner focus, or a rear focus to an initial valve position.
[0002]
[Description of the Prior Art] Although the front ball focus lens made to move the 1st lens group in the direction of an optical axis with a helicoid was common in this conventional kind of optical instrument, it is a variable power lens group recently. The zoom lens called the so-called inner focus or rear focus which performs focusing using a back lens group from a BARIETA lens is used.
[0003] In such a zoom lens, although photography of point-blank range is more possible than a front ball focus lens, it is also easy to constitute from a wide side so that it may focus especially in succession from just before a lens to the infinite distance and various lens types are known, an example of a configuration which uses a lens group most back for focusing here is shown in drawing 14.
[0004] For 1, as for a BARIETA lens and 3, in drawing 4 , the front ball lens of immobilization and 2 are [a fixed lens and 4] the lens groups of a focal lens (compensator). The guide bar for baffles in 133, the step motor a diaphragm unit (inserted in space and a right angle in the example of illustration) and whose 137 the feed rod of the BARIETA lens 2 and 135 are [for 134] focal motors as for a fixed lens-barrel and 136, and 138 are the output shafts of a step motor 137, and male screw processing for moving the lens group 4 is performed. 139 is a MENEJI processing part which gears with the male screw of this output shaft 138, and is united with the migration frame 140 of the lens group 4.
[0005] They are the backplate for 141,142 positioning the guide bar of the migration frame 140 of the lens group 4, and 143 positioning the guide bar, and pressing down, the ** gear by which a zoom motor and 146 were fixed to the reducer unit of the zoom motor 145, and 147 was fixed [144] to output-shaft 146a of the reducer unit 146 for a relay holder and 145, and the gear which 148 was fixed to the feed rod 134 of the BARIETA lens 2, and meshes with the above-mentioned gear 147.
[0006] In the above configuration, if a stepping motor 137 drives, the focal lens 4 will be driven in the direction of an optical axis with an output shaft 138. Moreover, if the zoom motor 145 drives, a feed rod 134 will rotate through a gear 147,148, and the BARIETA lens 2 will move in the direction of an optical axis.
[0007] Drawing 5 shows the physical relationship of both the lenses in each photographic subject distance when taking the location of the BARIETA lens 2 of such an inner focus, and the focal lens 4 along an axis of abscissa and an axis of ordinate, respectively.
[0008] The locus of 150-153 supports the following photographic subject distance, for example.
[0009]
[Table 1]

軌跡	被写体距離
150	∞
151	2cm
152	1cm
153	レンズ直前

Moreover, taking the physical relationship of both lenses that are equivalent to the field 154,155 which gave the slash is forbidden among drawing 5 .
[0010] thus, the so-called Bali that the location which should take a focal lens to each BARIETA location among a zoom with an inner focus lens changes with photographic subject distance -- there is Focas relation.
[0011] In such a lens, these people proposed previously the approach of controlling the physical relationship of a BARIETA lens and a focal lens among a zoom. Although these detailed explanation is avoided here, passing speed is determined in the location of the focal lens which should be taken according to the location of the BARIETA lens in a zoom from the map information shown in drawing 15 by which a certain absolute location encoder of a BARIETA lens and a focal lens which detects a location absolutely was formed as a common configuration, and memory was separately carried out to the positional information of each lens into the microcomputer.
[0012] Among these, when using the step motor other than a configuration, such as using a variable resistor, as an actuator as the detection approach of each lens group location, there is the approach of counting continuously the number of input pulses to a step motor.
[0013] In using such a detection approach, it becomes detectable [a location] absolutely by moving the lens group to detect to a predetermined measuring location by the time of a power source ON, and starting pulse count from the location.
[0014] Therefore, another pilot switch, for example, a photograph interrupter, for measuring location (reset location) detection is usually prepared.
[0015] Drawing 6 and drawing 7 are the examples which prepared such two photo interrupters. The protection-from-light section 156 of a photo interrupter is formed in one with the migration frame 140, and the interrupter 159 has the light emitting device 158 and photo detector 157 by which opposite arrangement was carried out.
[0016] As the interrupter 159,160 was formed, and gets down in this example and the total displacement range of the lens group 4 is shown in drawing 8 , they are three fields I, II, and III. It is divided. As a measuring location, they are I-II boundary ** and II-III. Although two places of boundary ** are mentioned, when either sets the address at the time of count initiation in ** location to a so that it may be consistent, and it sets ** location to b, it cannot be overemphasized that the value of a-b is constituted so that the need may be in agreement with migration between **s with the number of steps.
[0017] Moreover, when the interrupter 159,160 of drawing 6 and drawing 7 is used as a photo interrupter, respectively, it is field I-III by coding, as shown in Table 1. It is distinguished, and 1 is in a protection-from-light condition, and 0 is in the condition of not shading.
[0018]
[Table 2]

表 1

	I	II	III
フォトインタラプタ 159	1	0	0
フォトインタラプタ 160	0	0	1

If the number of photo interrupters will be absolutely increased although the purpose of location detection will be attained if there is one measuring location, and it is made two places or three places or

more, there is a merit that improvement in the speed of measuring location **** at the time of a power source ON can be timed.
[0019] It is shown where [of location ** as shown by drawing 8 , and **] Table 2 makes a measuring location.
[0020]
[Table 3]

表 2

レンズ位置	I	II	III
リセット位置	①	①又は②ＡＦ結果による	②

Although the reset location in case the lens group 4 is in Field II was made into ** here, it does not matter as **. It cannot be overemphasized that the time amount which reaches that location from that whose measuring location is one place becomes short by making it this appearance.
[0021]
[Problem(s) to be Solved by the Invention] however, in the above-mentioned conventional example, although two or more photo interrupters are prepared, and carry out reset location appearance and time amount is shortened in the meantime, AF actuation, in order not to operate, to carry out reset location appearance and to move to AF actuation after termination In the case so that it may be hard to do direction detection (MAEPIN, ATOPIN detection) of AF actuation in a reset location (For example, the photographic subject is fading greatly) Time amount is taken until a focus suits after that, and it was hard to say that sufficient consideration was made to shortening of time amount until it becomes the situation which is satisfactory as an image recorded [which were recorded and was record-started] after all.
[0022] This invention aims at offering the optical instrument which canceled the above troubles.
[0023]
[Means for Solving the Problem] This invention is equipped with the driving means which drives a lens group in the direction of an optical axis, and a location detection means to detect at least one location in the successive range of this lens group. By performing automatic-focusing accommodation to coincidence in the time amount which moves said lens group to the location detected by this location detection means it is the optical instrument which performs which measuring location is used according to the direction detection result of AF, evaluates AF, carries out measuring location appearance also during migration in a measuring location, is reflected in next lens migration, and shortens the total time of concentration to the situation after a power source ON which can be photoed.
[0024]
[Example]
The example of this invention is explained about a drawing below example 1.
[0025] Table 3 is each field I-III shown in said drawing 18. When there is a lens group and power-source ON is carried out, it is shown which location is made into a measuring location.
[0026]
[Table 4]

表 3

レンズ位置	I	II	III
リセット位置	① I→II	② II→III	② III →II

When a lens group is in Field II, it depends on the result [which it shall be made between ** and **] of direction detection (are they MAEPIN or ATOPIN?) of AF first.
[0027] Usually, when looking for a focus location with the high frequency component F of a Y signal which was mentioned above, it is common to carry out very small vibration of the lens group, and to detect a direction from an oscillating phase and the location of F signal.

[0028] moreover, fields I and III from -- although it becomes the same [a reset location] as that of the conventional example, the points which carry out won CHINGU of the F signal also in that case differ conventionally.
[0029] Drawing 1 is a flow chart which shows the reset action from Field I, and supposing the lens migration to Y-axis down is a **** lump, a lens will drive it at a step ST 1-1 to the **** lump side which is the reset direction. Although reset location ** was detected at a step ST 1-2, when it distinguishes in how and is not detected yet, it is F current by ST 1-3 and ST 1-4 F0 F0 before a round F1 It stores.
[0030] Next, it is F0-F1 at ST 1-5. It is distinguished in forward or negative. Since the F value is increasing in the forward case, while a lens group moves in the reset direction, it will move in the focus direction at coincidence. Under the present circumstances, the value of C is set to C= 0 by ST 1-7.
[0031] On the other hand, when F0-F becomes negative and what was forward becomes negative before that, it can be assumed that the focussing-lens location was passed in the location. Moreover, in a negative case, it can be assumed from the beginning that the focussing-lens location already had the location of the lens group in a reset action start time in the delivery side from the location.
[0032] Anyway, it is F0-F1 to the beginning. The location used as negative is set to C= 0, and a pulse number (input pulse to a step motor) is continuously counted from there to reset termination (ST 1-6).
[0033] After [reset location detection (i.e., when the decision result of ST 1-2 is YES)], the reset address R01 (these R01 is defined beforehand) which is a measuring value will be read (ST 1-8), and the absolute location of a lens group will understand n pulse ****** and its location in the delivery direction as n pulse ****** (R01-n) in the **** (R01+n) lump direction henceforth (ST 1-9). However, suppose that it counted as + also in the time of the value foil ****** direction of C. Here, it is R1. R01+C is computed by carrying out.
[0034] Next, R is R1 at ST 1-10. A lens group is compulsorily moved so that it may become a location, and it is usually taken over to a routine for the first time after that.
[0035] By carrying out like this, it is usually at the AF taking over time, and since the location of a lens group is put more into AF from the location near the focus rather than the location considered to be the focus detected during reset, or a reset location, time amount until it results in an after [power-source ON] -> reset -> focus condition can reduce it from a device conventionally.
[0036] Drawing 2 is Field III. Reset is shown, it is fundamentally the same as that of the reset action from Field I, and by ST 3-1, first, it is the flow chart which shows the reset action from Field II, and it performs [drawing 3 which performs the reset action of a step ST 2-1 - ST 2-10 carries out very small vibration of the lens group, and] detection of MAEPIN or ATOPIN. By ST 3-2, it distributes based on the detection result. If a detection result is NO, the delivery direction drive will be performed by ST 3-3, and if a detection result is YES, i.e., MAEPIN, three to four or less-ST actuation will be explained.
[0037] Since it moves to the side in which a focussing-lens location exists as reset direction ** when the detection result of ST 3-2 is MAEPIN, it considers as the **** lump direction drive (ST 3-4). And when it is distinguished whether it is reset location ** and it is not a reset location in ST 3-5, it is the present F0 like [in ST 3-6 - ST 3-8] the case of said drawing 1 . The difference between F1 before a round is searched for, and, in a forward case, it is begun to count C by ST 3-10 from the time of changing to negative from C= 0 and forward by ST 3-9. The same actuation as the case of said drawing 1 is performed to reset location ** by ST 3-11 - ST 3-13 after attainment.
[0038] In addition, an example shows a location with two measuring locations, performs which measuring location is used according to the direction detection result of AF, and is evaluating AF also during migration in a measuring location. By method which is made into the focussing-lens location of focusing with the peak signal of the high frequency component of a general Y signal with a video camera, evaluation of this AF shows that F is measured also during the migration for measuring location ****, when the value of the short course component of this Y signal is set to F.
[0039] therefore, as a premise of operation of this invention, this measuring location appearance of the standup of photography, such as CCD, will be carried out, and it will be the requisite of being early enough, as compared with actuation. Moreover, even when a measuring location is one place as usual, it

is possible to take the same configuration as an example.
[0040]
[Effect of the Invention] As explained above, according to this invention, on the occasion of migration in the measuring location of an inner focus lens, the direction detection result of AF is taken into consideration to the decision of the **. migration direction.
[0041] ** . The evaluation signal (high frequency component of a Y signal) of AF is measured after migration initiation, and when there is a focus location on the way, the distance of a focus location and a reset location is found.
[0042] ** . In **, time amount until a focus screen is obtained after a power source ON can be sharply shortened after reset by having made it take over to the usual AF actuation after moving to a focus location at high speed.

[Translation done.]

* NOTICES *

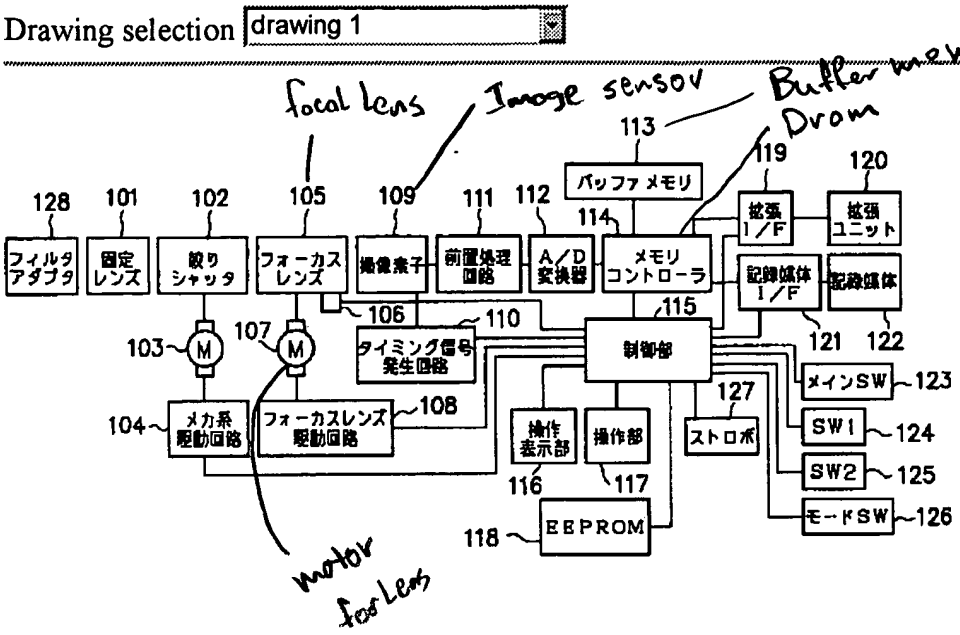
1.This document has been translated by computer. So the translation may not reflect the original precisely.
2.**** shows the word which can not be translated.
3.In the drawings, any words are not translated.

CLAIMS

[Claim(s)]
[Claim 1] The optical instrument characterized by performing automatic-focusing accommodation at coincidence in the time amount which moves said lens group to the location which is equipped with the driving means which drives a lens group in the direction of an optical axis, and a location detection means to detect at least one location in the successive range of this lens group, and is detected by this location detection means.

[Translation done.]

Drawing selection drawing 1



[Translation done.]